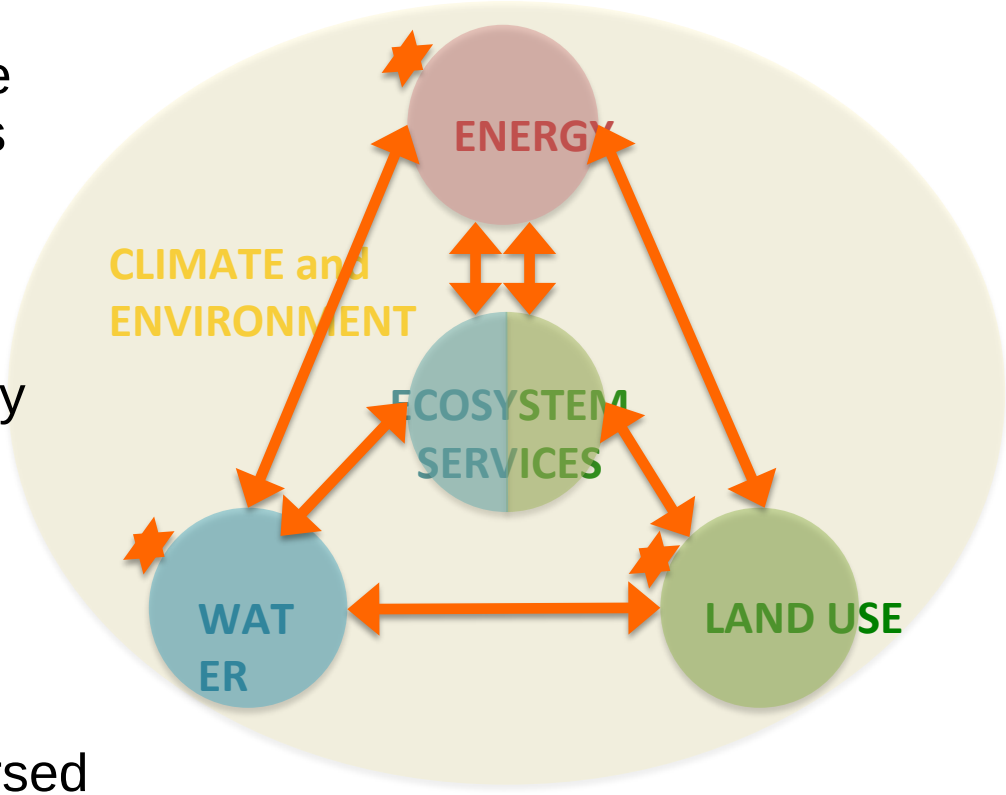
Insights from the resource nexus - Water-Food-Energy-Ecosystems - The role of renewable energies in the Sava and the Drina Basins

Annukka Lipponen, Environmental Affairs Officer
UNECE Environment Division

UNECE

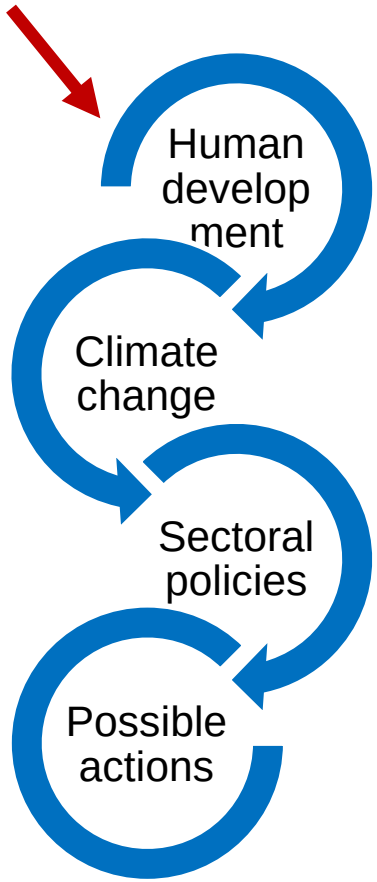
Intersectoral (nexus) assessments: the framework

- A part of the Programme of Work 2013-2015 under the UNECE Water Convention, adopted by the Parties; continues 2016-2018
- Basin selection: a call for proposals (11/2012). Assessed: Alazani/Ganikh, Sava, Syr Darya, Isonzo/Soča
- mandate from Meeting of the Parties (MoP); Task Force on the Water-Food-Energy-Ecosystems Nexus established to guide the work and to provided oversight;
- assessments prepared in close cooperation with and reviewed by the national administrations;
- Assessment methodology developed; endorsed by the 7th Meeting of the Parties (17-19 November 2015, Budapest); general recommendations endorsed



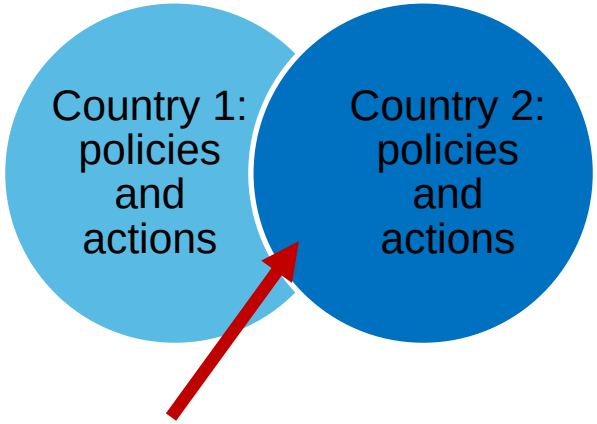
Why a Water-Food-Energy-Ecosystems Nexus in transboundary river basins?

Water-Food-Energy-Ecosystems Nexus



Need to integrate/coordinate:

1. A better understanding of inter-sector and inter-resources dynamics allows accounting for impacts & more effective resource management
2. To make policies and actions more coherent across sectors and countries

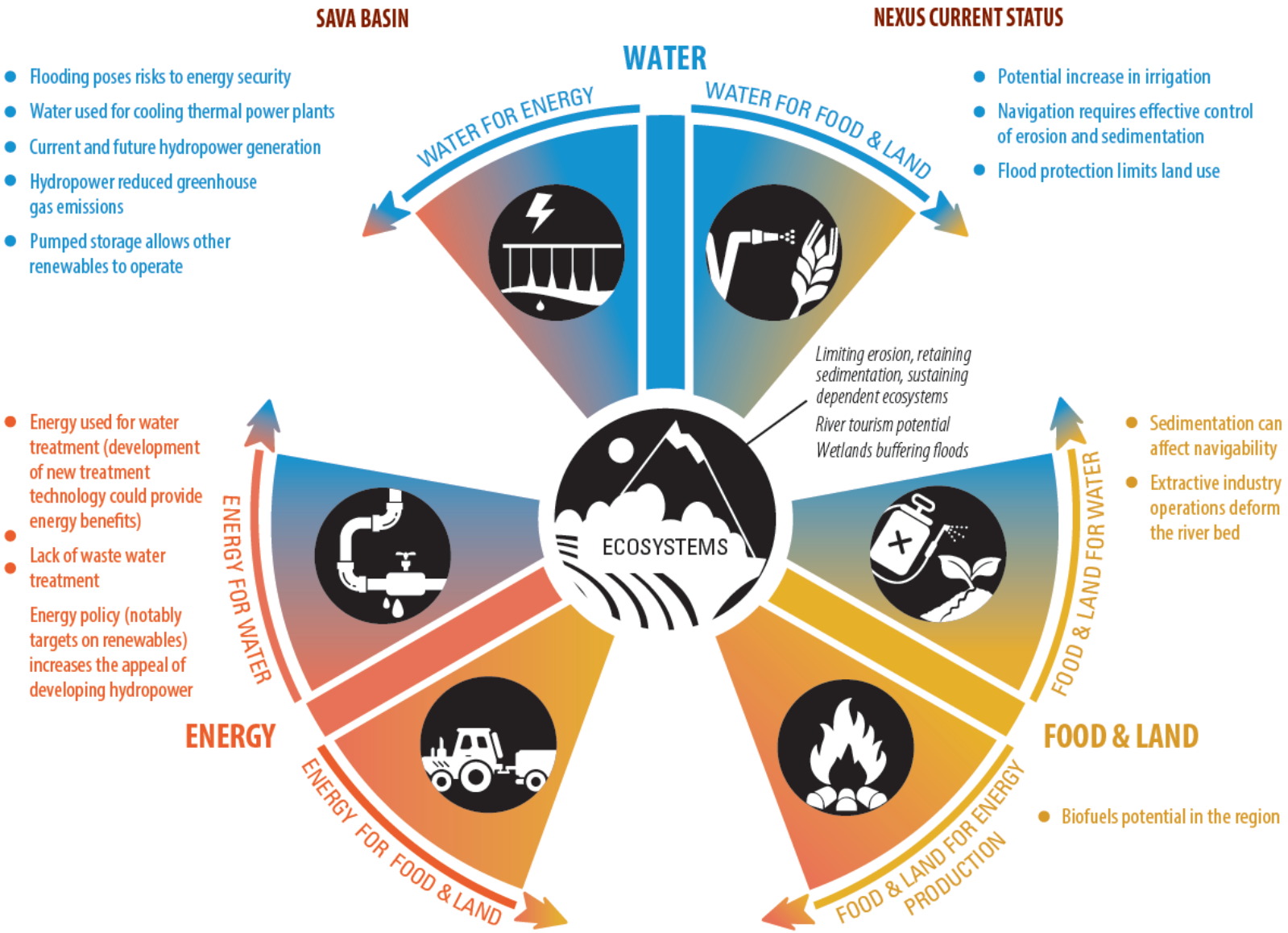


Communication, collaboration and joint action!

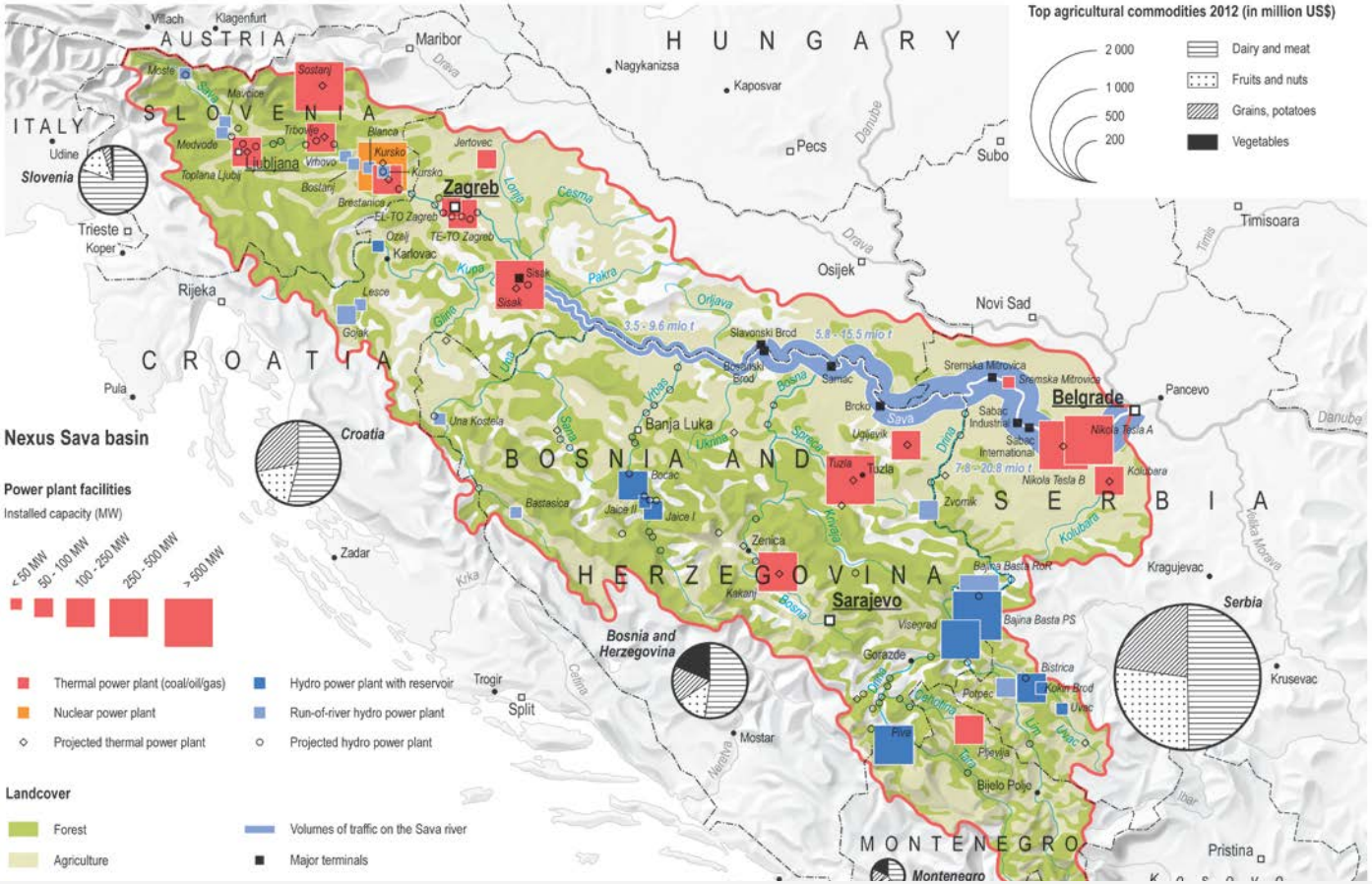
Six Steps of the Nexus Assessment

	Step	Location	Sectors
1	**Identification of basin conditions, the socio economics**	Desk study	General. Information normally used to underpin sectoral planning. Key elements include general socio-economic goals.
2	**Identification of key sectors and stakeholders**	Desk study	General. Requires expert judgment understanding of local context, governance.
3	**Analysis of the key sectors**	Desk study/ 1st Workshop	Individual sector experts and plans. Key elements include identifying resource flows and institutional mapping.
4	**Identification of intersectoral issues**	1st Workshop	Sectoral group discussion on interlinkages (input needs, impacts and trade-offs), and discussion on sectoral plans
5	**Nexus dialogue and future developments**	1st Workshop	Agreeing on a prioritization of main interlinkages. How the interlinkages are expected to change (development trends, key uncertainties and drivers)
6	**Identification of opportunities for improvement**	1st & 2nd Workshop/Desk study	Identification of solutions with multiple impacts between sectors, scales and boundaries

Nexus linkages: the Sava Basin



The Sava Basin: national energy mixes, spatial distribution of electricity generation



SI

3.4 million kW

of which

Hydropower 1.3 million kW *

Hydropower 37 %
Fossil fuels 36 %
Nuclear 21 %
Other renewables 6 %

HR

4.2 million kW

of which

Hydropower 2.1 million kW *

Hydropower 51 %
Fossil fuels 45 %
Other renewables 4 %

BA

4.3 million kW

of which

Hydropower 2.15 million kW

Hydropower 50 %
Fossil fuels 50 %

RS

8.8 million kW

of which

Hydropower 2.8 million kW *

Hydropower 32 %
Fossil fuels 63 %
Other renewables 5 %

ME

0.9 million kW

of which

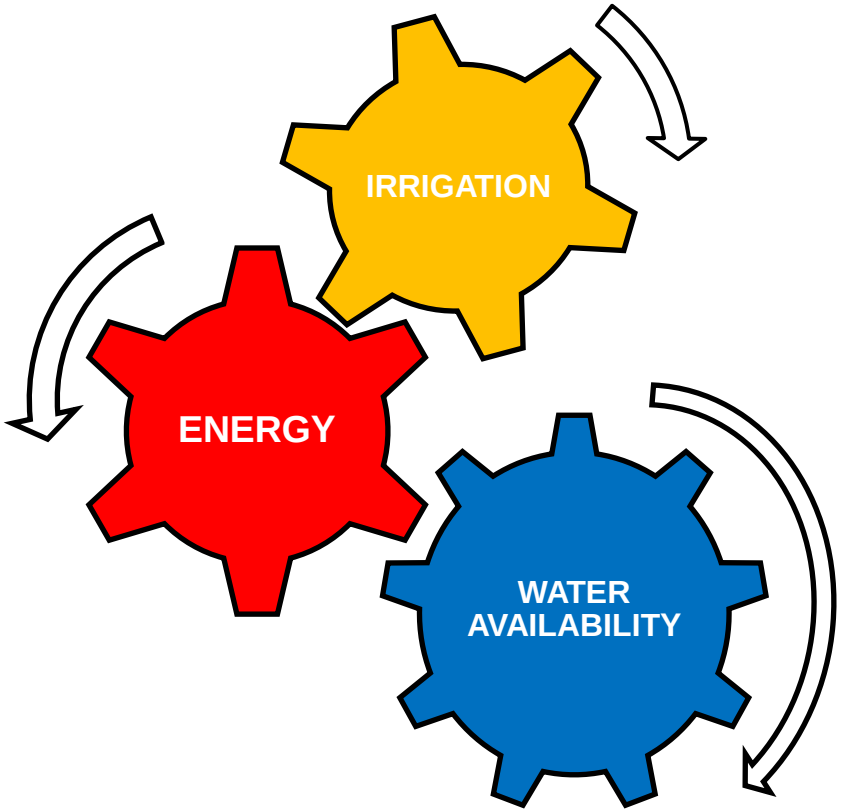
Hydropower 0.7 million kW

Hydropower 76 %
Fossil fuels 24 %

* including pumped storage

Integrated water-energy analysis - basis for identifying opportunities

Development of a **multi-country water-energy model** focusing on the electricity generation facilities located in the Sava River Basin.

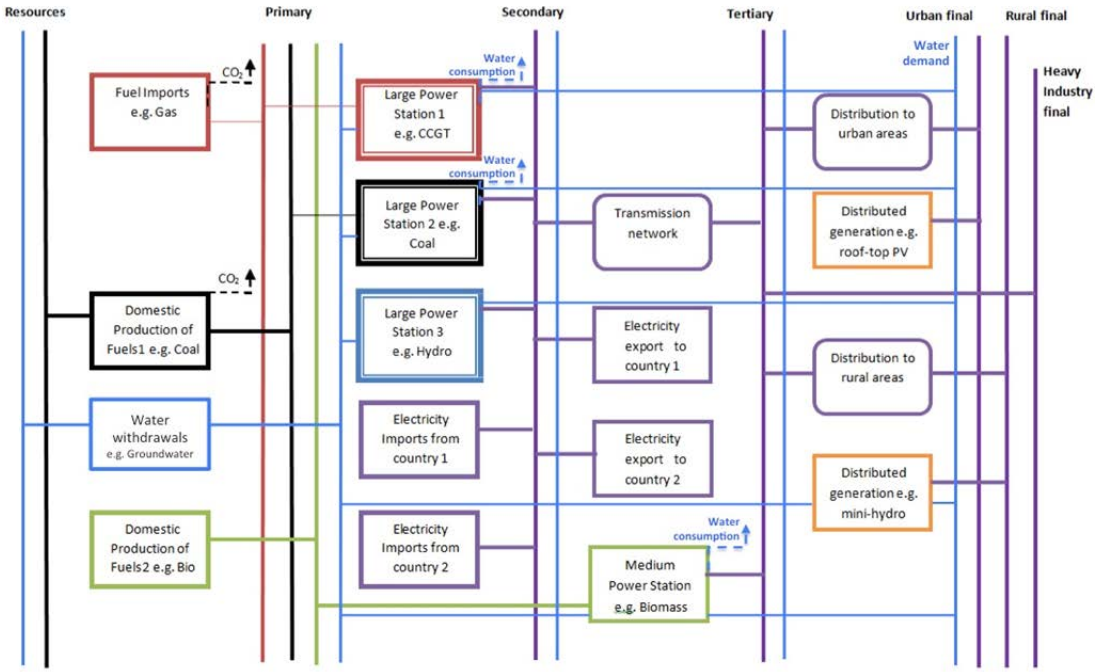


- Investigate the dependences between the SRB water resources and the energy sector;
- Identify the **impacts of climate change on hydropower generation** through changes in water availability in the region and at a country level;
- Assess the implications of an increase in **water demand for irrigation on electricity generation**;
- Study the **trade dynamic-response of the multi-country energy system** under water availability constraints;
- Environmental issues: **CO_2 emissions and water resources use** in electricity generation.

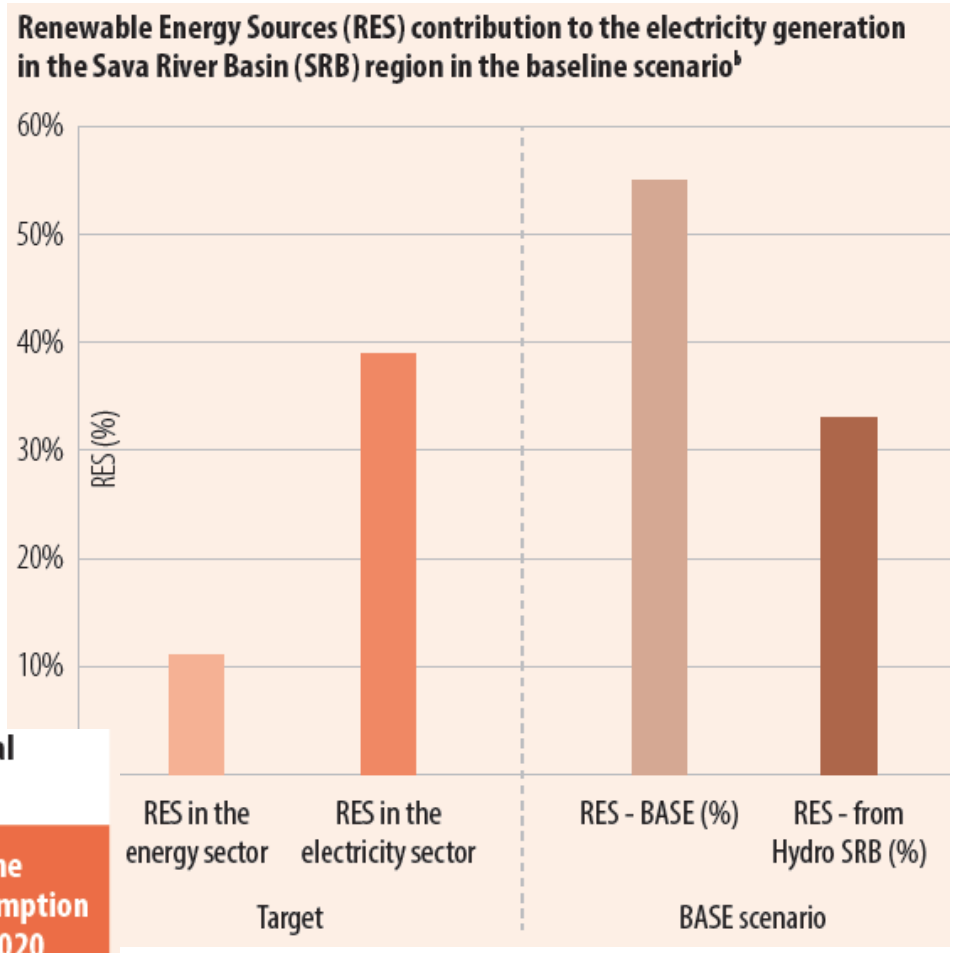
Integrated water-energy analysis - basis for identifying opportunities

The water-energy model took into account…

- Electricity demand of the SRB countries;
- Countries' load profile;
- Existing and planned electricity generation facilities;
- NREAP targets;
- CO_2 emission factors;
- Water consumption factors of thermal power plants;
- Electricity trade in the region;
- Inflows at selected hydropower plants locations.



Importance of RES for energy generation in the Sava countries



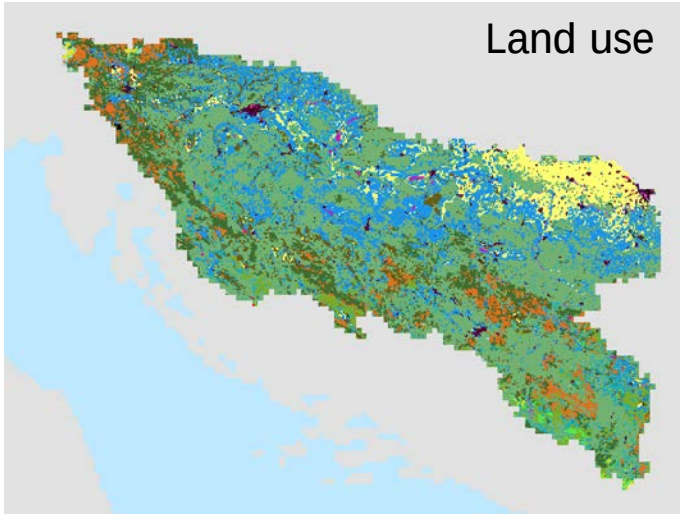
Renewable Energy Sources targets in energy and electricity gross final consumption for 2020

Countries	Overall RES share in 2009	Overall RES share in 2020	Share of RES in the gross final consumption of electricity in 2020
Slovenia	16.2%[a]	25.3%	39.3%
Croatia	12.8%[a]	20.1%	39.0%
Bosnia and Herzegovina	34%	40%	44.0%
Serbia	21.2%	27.0%	36.6%
Montenegro	26.3%	33.0%	51.4%

UNECE

Analyses / modelling (JRC)

- Modelling **water availability** versus **water demand** (identifying areas and sectors with water scarcity) and how this might change, under
  - **Future climate** as compared to **current climate**
  - **Modified land use / measures** (e.g. increased irrigation) as compared to **current land use**
- **Water demands** (agriculture, industry, public sector) taken into account, and how they change under future GDP, population, etc.
- Addressing **ecological flow**
- Estimating **economic damage** for individual sectors (agriculture, navigation, industry, etc.) under water scarcity and how this changes after taking measures
- Including **investment** and maintenance costs



Taken from JRC, 2014

The way ahead, towards specifying benefits of cooperation and intersectoral coordination: the Drina Basin project

- Follow up to the Sava assessment, allows focusing on the priority issues as well as detailing and concretizing specific actions
- Funded by the Italian Ministry for the Environment, Land and the Sea as “Greening economic development in Western Balkans through applying a nexus approach and identification of benefits of transboundary cooperation”
- Budget: 300,000 EUR
- Implemented by UNECE with partners
- Part of the Programme of Work 2016-2018 of the Water Convention; contributes to the work of the Group of Experts on Renewable Energy
- Contributes to implementation of the SDGs
- Feedback for shaping the project and active engagement in the subsequent stages needed from the riparian countries

Why a nexus approach in the Drina?

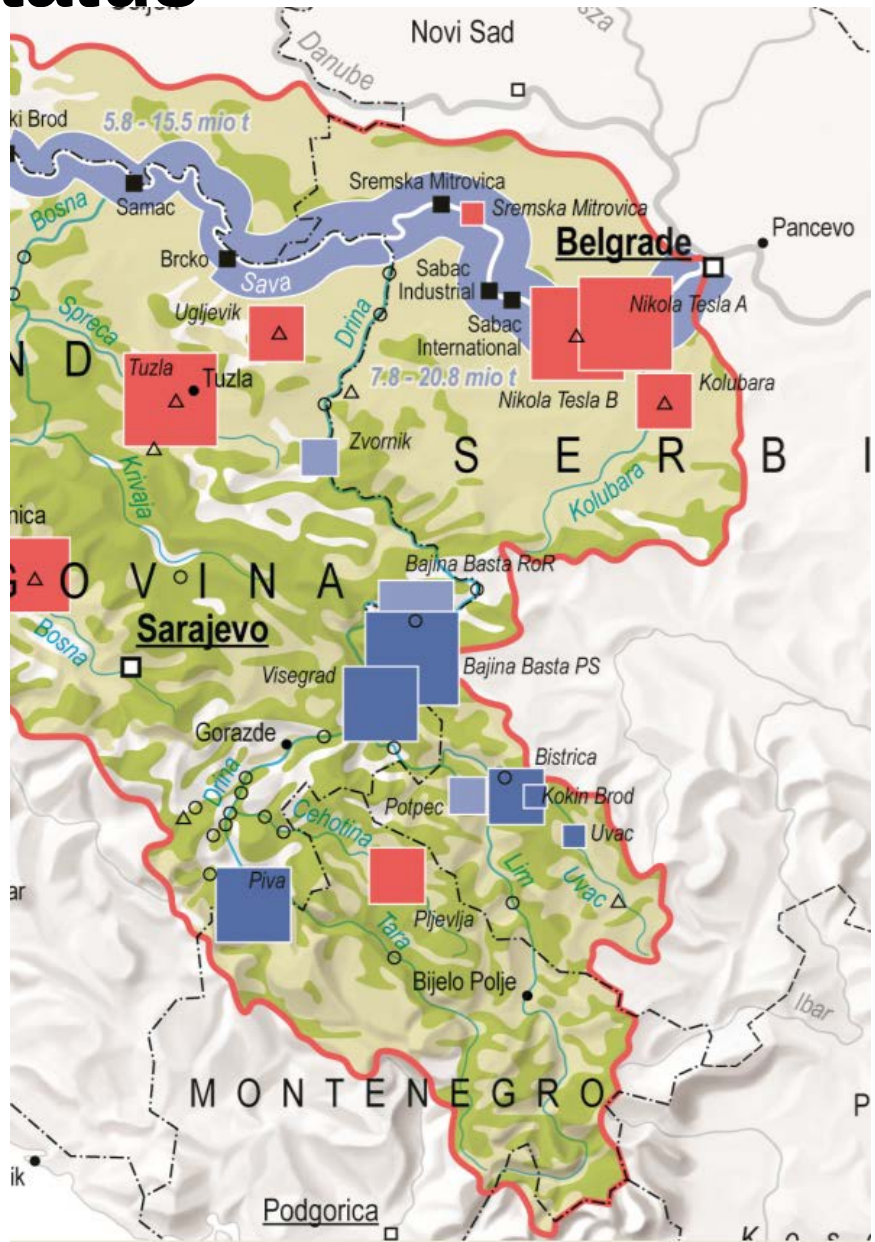
National & regional development

- Has implications, also across borders
- Cuts across sectors
- Can create vulnerabilities

The nexus approach combined with a study of benefits can help

- Exploring policy inconsistencies and potential shared benefits
- Better understanding the interconnections
- Informing dialogue
- Selected quantification for operational solutions
- Identify opportunities for benefits (economic, social and environmental, peace and security, regional economic cooperation benefits) to motivate action

Status



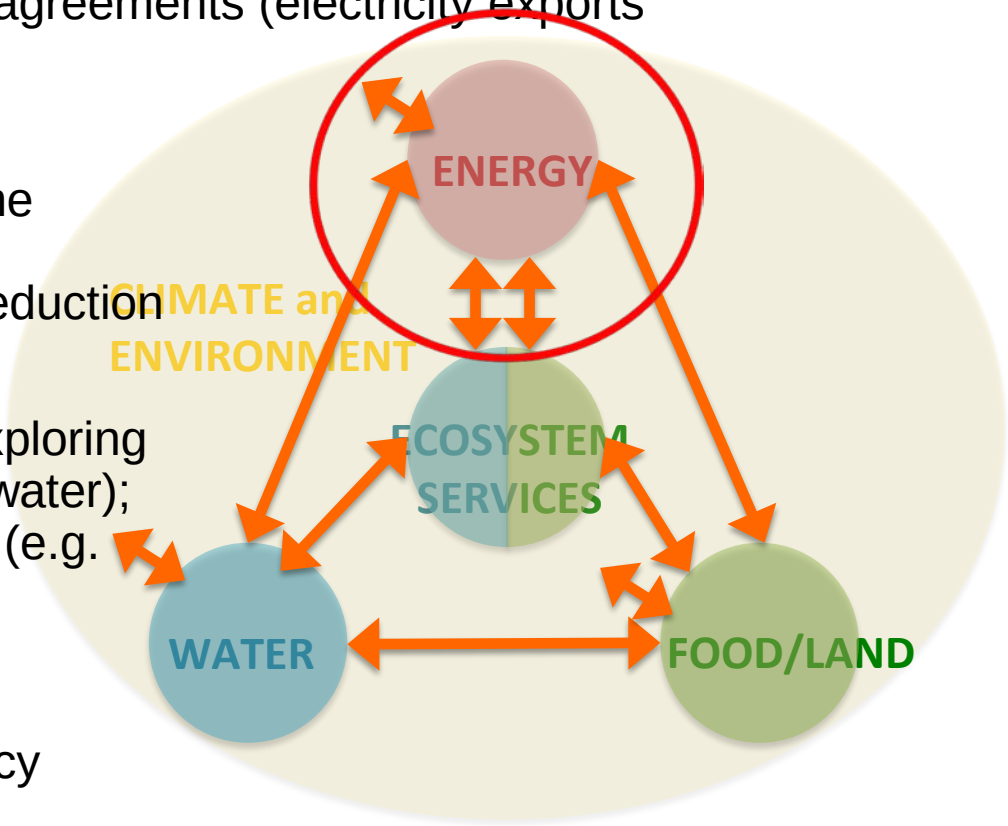
- **ENERGY SECTOR**
  - Current practice of hydropower operation
  - Hydropower expansion in the basin and the role of regional projects
  - Foreign investments in the power generation sector (cooperation mechanisms)
  - Energy security and added potential for electricity exports
- **ENVIRONMENT and other sectors**
  - Nature reserves and protected areas
  - Tourism activities relevant for the region
  - Rural development needs, agricultural productivity
  - Preservation of ecosystems
- **CLIMATE VARIABILITY**
  - Torrential flow regime sensitive to precipitation patterns
  - Area prone to droughts and flooding

Possible issues – up for discussion: Energy

- Harmonized operation of hydropower plants (existing and planned);
- Impact of hydropower development to achieve emission reduction targets in the submitted intended nationally determined contributions (INDCs) of the COP21 Paris agreement;

Relevance of the regional projects in the national and regional energy systems;

- The impacts of cooperation mechanisms in the energy sector (generation and transmission) and of electricity trade agreements (electricity exports commitments to EU countries);
- RES penetration and feed-in-tariffs;
- Contribution of non-hydro RES in the replacement of hydro projects (environment, tourism) and in the reduction of CO_2 emissions;
- Integrated study of the above: a) exploring competing uses of resources (e.g. water); b) overall impact of climate change (e.g. water availability).
- Changes in power sector evolution
- Impact of increased energy efficiency
- Policies for private sector investment



Analysis could explore: Where are the benefits?

- Aim to **identify where the countries and sectors could mutually benefit** from cooperation and improved coordination
- The possible focus will be explored, starting with a rapid scoping, eventually to be agreed with the riparian countries
- Some options (generally)
  - benefits linked to different **flow regulation regimes**, considering environmental factors (e.g. environmental flows) as well as implications to land management, agriculture and tourism.
  - Intersectoral effects and planned future economic developments, considering possibilities for transboundary multi-criteria optimization: **integrating other renewable energies, possibilities of multiple use of water storage, trade of electricity and balancing services** etc.
  - robustness of hydropower development and operation plans at the face of **climate change**
- Countries can benefit from **exchange of experience** in regulation, economic instruments, complying with regional commitments

Selected conclusions

- **Different forms of energy generation depend heavily on water resources,** and other sectors' development plans may change water availability and the economics of projects
- **Energy sector commonly not represented in institutions for transboundary water cooperation** (even when multisectoral); difficult to engage the energy sector into a dialogue about water
- The strong demand for hydropower provides the opportunity to invest in **multi-functional infrastructure** or to adopt designs that minimise impact on the environment.
- **Better aligning of planning across sectors** in terms of timescales beneficial – the energy sector is defining investment plans with decades of anticipation while river basin management plans have shorter horizons, e.g. six years (the EU); good practices in coordination?
- **Transboundary risks to business**: adequacy of EIA and impacts -> risk of significant delays to permitting; water availability or quality may change vary unexpectedly due to upstream developments Common agreement about priority projects and river sections for infrastructure development or no-go zones reduces the investment risks